

What Is Claimed Is:

1. An energy absorbing plunging constant velocity joint comprising:

an outer joint part having a plurality of outer ball tracks, and an outer extended axial range;

5 an inner joint part having a plurality of inner ball tracks, and an inner extended axial range;

a plurality of torque transmitting balls each guided in a normal axial range of a corresponding pair of said outer and inner ball tracks, wherein each corresponding pair of said inner ball tracks and said
10 outer ball tracks form angles of intersection in respect of an axis, said angles being identical in size but set in opposite directions, and alternates with each corresponding pair of said inner ball tracks and said outer ball tracks being axially straight in respect of said axis;

a ball cage having a plurality of cage windows each
15 accommodating one of said balls and which hold said balls in a plane when said torque transmitting balls are in communication with said inner ball tracks and said outer ball tracks; and

one or more energy absorption surfaces distal to the normal axial range and located within the outer extended axial range upon said
20 outer joint part or the inner extended axial range upon said inner joint part, wherein the energy absorption surface interferes with at least one of the plurality of torque transmitting balls when said joint is operated beyond said normal axial range.

2. The joint according to claim 1, wherein one of the
25 energy absorption surfaces is a circlip.

3. The joint according to claim 2, wherein the circlip is made from a deformable material.

4. The joint according to claim 3, wherein the deformable material is metal.

5 5. The joint according to claim 3, wherein the deformable material is plastic.

6. The joint according to claim 2, wherein the circlip is a ring.

7. The joint according to claim 2, wherein the outer joint
10 part further comprises a cylindrical open end located adjacent the outer extended axial range and distal to the normal axial range of the outer joint part and a grease cover sealingly attached to the cylindrical open end.

8. The joint according to claim 7, wherein the grease cover
15 is displaceable when the joint has axial travel beyond the outer extended axial range.

9. An energy absorbing plunging constant velocity joint comprising:

an outer joint part having a plurality of outer ball tracks, and
an outer extended axial range;

20 an inner joint part having a plurality of inner ball tracks, and
an inner extended axial range;

a plurality of torque transmitting balls each guided in a normal axial range of a corresponding pair of said outer and inner ball tracks, wherein each corresponding pair of said inner ball tracks and said outer ball tracks form angles of intersection in respect of an axis, said angles
5 being identical in size but set in opposite directions, and alternates with each corresponding pair of said inner ball tracks and said outer ball tracks being axially straight in respect of said axis;

a ball cage having a plurality of cage windows each accommodating one of said balls and which hold said balls in a plane when
10 said torque transmitting balls are in communication with said inner ball tracks and said outer ball tracks; and

one or more energy absorption surfaces distal to the normal axial range and located within the outer extended axial range upon said outer joint part or the inner extended axial range upon said inner joint part,
15 wherein the energy absorption surface interferes with said ball cage or with at least one of the plurality of torque transmitting balls when said joint is operated beyond said normal axial range.

10. The joint according to claim 9, wherein one of the energy absorption surfaces is a bore surface.

20 11. The joint according to claim 10, wherein the bore surface has at least one inclination, stepped inclination or variable inclination.

12. The joint according to claim 10, wherein the bore surface is made from the same material piece as the outer joint part or the
25 inner joint part.

13. The joint according to claim 9, wherein one of the energy absorption surfaces is a track surface.

14. The joint according to claim 13, wherein the track surface has one or more tapers or a stepped taper.

5 15. The joint according to claim 14, wherein the track surface is made from the same material piece as the outer joint part or the inner joint part.

16. The joint according to claim 9, wherein the outer joint part further comprises a cylindrical open end located adjacent the outer
10 extended axial range and distal to the normal axial range of the outer joint part and a grease cover sealingly attached to the cylindrical open end.

17. The joint according to claim 16, wherein the grease cover is displaceable when the joint axially travels beyond the outer extended axial range.

15 18. The joint according to claim 9 further comprising one or more circlip energy absorption surfaces.

19. A propeller shaft assembly for a vehicle having an energy absorbing plunging constant velocity joint comprising:
an outer joint part having a plurality of outer ball tracks, and
20 an outer extended axial range;
an inner joint part having a plurality of inner ball tracks, and
an inner extended axial range;

a plurality of torque transmitting balls each guided in a normal axial range of a corresponding pair of said outer and inner ball tracks, wherein each corresponding pair of said inner ball tracks and said outer ball tracks form angles of intersection in respect of an axis, said angles
5 being identical in size but set in opposite directions, and alternates with each corresponding pair of said inner ball tracks and said outer ball tracks being axially straight in respect of said axis;

a ball cage having a plurality of cage windows each accommodating one of said balls and which hold said balls in a plane when
10 said torque transmitting balls are in communication with said inner ball tracks and said outer ball tracks; and

one or more energy absorption surfaces distal to the normal axial range and located within the outer extended axial range upon said outer joint part or the inner extended axial range upon said inner joint part,
15 wherein the energy absorption surface interferes with said ball cage or with at least one of the plurality of torque transmitting balls when said joint is operated beyond said normal axial range;

a hollow shaft connected to said outer joint part; and
a connecting shaft connected to said inner joint part,
20 wherein the hollow shaft is configured to receive the connecting shaft, the inner joint part, the ball cage and the torque transmitting balls when said joint is operated beyond the extended axial range.

20. The joint according to claim 19, wherein the outer joint
25 part further comprises a cylindrical open end located adjacent the outer extended axial range and distal to the normal axial range of the outer joint

part and a grease cover sealingly attached to the cylindrical open end, wherein the grease cover is displaceable when the joint axially travels beyond the outer extended axial range.